

## PROTOTYPE CABLES

**DECEMBER 1, 1999**

**MODULE SESSION**

**E. ANDERSSSEN, LBNL**

# PIXEL DETECTOR

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## REMINDER

- **PROMISED SINGLE MODULE ELECTRICAL CABLE CHAIN BY END OF YEAR**
  - ELECTRICALLY REALISTIC, NOT NECESSARILY MECHANICALLY
  - INTERFACES TO PIXEL SUPPORT CARD, NOT DIRECTLY TO MODULE
- **TWO OPTIONS-ROUND WIRE AND FLEX CABLE FOR POWER DELIVERY**
  - SUB OPTIONS TO INCLUDE TWISTED PAIR POWER
  - COPPER TO SUBSTITUTE FOR AL TO PROVE OUT ELECTRICALLY BEFORE INVESTING IN ALUMINUM
- **COMPONENTS**
  - PIGTAIL FLEX (NON-MECHANICALLY CORRECT)
  - TYPES I & II LOW MASS CABLES (+ OPTIONS)
  - CONVENTIONAL TYPES III & IV CABLES
  - CONNECTORS

# PIXEL DETECTOR

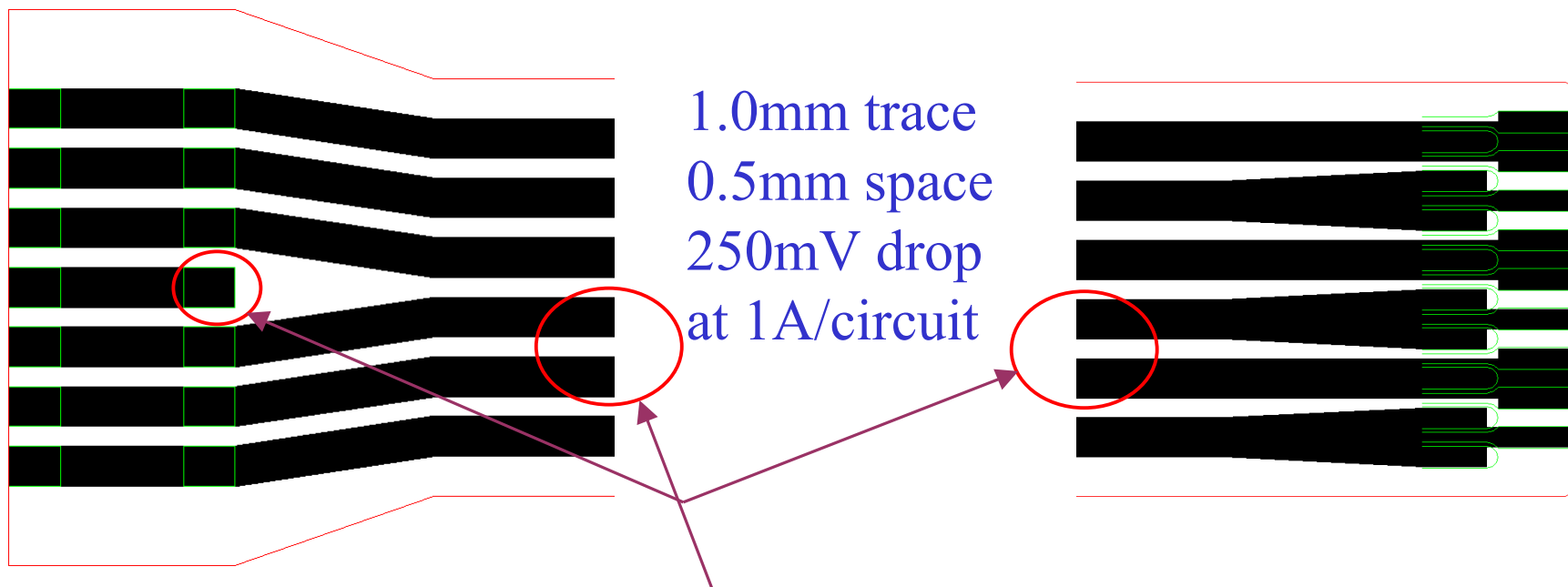
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## PIGTAIL PROTOTYPE

- **WARNING: MAY LOOK FAMILIAR**
- **FILES ASSOCIATED WITH DESIGN**
  - EDMS: [ATLAS>PIXELS>PBS>SERVICES>CABLES](#)
- **SPECIFICATION COMMENTS**
  - **VOLTAGE DROP**
    - AT 1 A PER CIRCUIT, 25 $\mu$  CU, TRACE WIDTHS ON THE ORDER OF 1 MM GIVE  $\Delta V$  OF 250mV FOR 20CM PIGTAIL
  - **VOLTAGE STANDOFF**
    - HV STANDOFF WILL BE ACCOMPLISHED BY REMOVAL OF ADJACENT PINS AND TRACES ON THE PIGTAIL AND CONNECTORS
  - **PHYSICAL/ELECTRICAL SIMILARITY TO FINAL DESIGN**
    - PROPOSED PIGTAIL IS NOT PHYSICALLY SIMILAR TO FINAL PIGTAIL
    - ELECTRICAL SIMILARITY IS LIMITED TO THE VOLTAGE DROP OF THE MAXIMUM PIGTAIL LENGTH. PAIRING OF SIGNALS CANNOT BE DONE IN A REMOTELY SIMILAR FASHION PHYSICALLY (SINGLE V.S. DOUBLE SIDED FLEX)
  - **MATERIALS**
    - SUBSTRATE: NOT TO EXCEED 125 $\mu$  KAPTON
    - COPPER: SINGLE SIDED 25 $\mu$
    - G-10: UP TO 100 $\mu$  REQUIRED TO REINFORCE/BUILDUP THICKNESS INSIDE OF CONNECTOR (SEE BERG\_FPC.PDF)
    - G-10: 500 $\mu$  TO REINFORCE UNDER MINI VP CONNECTOR-NEED TO RESIST UP TO 3kgF DEMATING FORCE
    - COVERLAY: EITHER STANDARD SOLDERMASK, OR KAPTON TAPE/FILM LAMINATE MINIMUM 50 $\mu$
- **DESIGN HAS NO PREFERRED TRACES (EXCEPT HV TRACE)**
  - AMP CONNECTOR ALLOWS FOR RANDOM DISTRIBUTION OF CONNECTOR PINS EASING DISTRIBUTION OF TRACES ON BOARD
  - HV CAN BE EITHER ON THE LEFT OR RIGHT, I HAVE CHOSEN RIGHT-SEE PAGES 4/6 TO SEE WHAT I MEAN BY "RIGHT".
- **TWO FLEX CABLES ARE REQUIRED PER MODULE SUPPORT CARD**
  - ONE PIGTAIL WILL CARRY VDD, VDDA, AND VCCA, THE OTHER WILL CARRY PT1000 AND VDEP(HV).
  - VDET + PT1000 FLEX HAS TWO TRACES MASKED OUT OF ARTWORK TO STAND OFF HV-ALSO NO PINS ARE INSERTED INTO MINI VP CONNECTOR PLUG

# PIXEL DETECTOR

## PIGTAIL TERMINATIONS

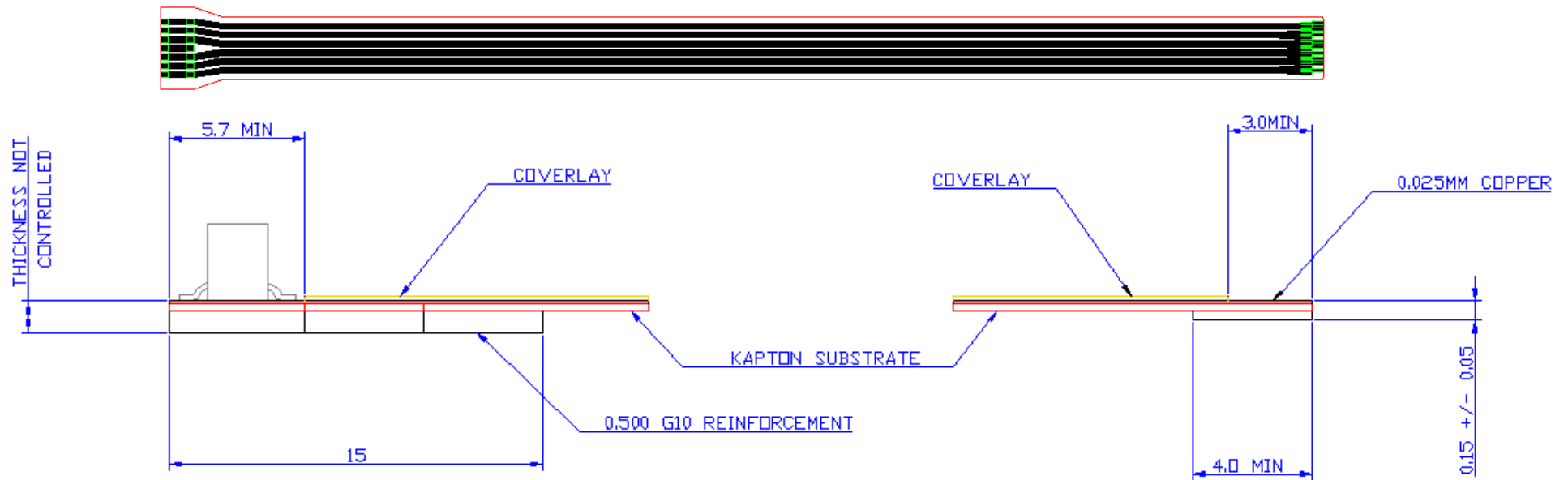


CONNECTOR END OF PIGTAIL  
AMP MINI VP CONNECTOR  
SOLDERED TO TRACES WHICH  
CORRESPOND TO SOLDER PADS  
AS DEFINED IN: [AMP\\_MINIVP.PDF](#)

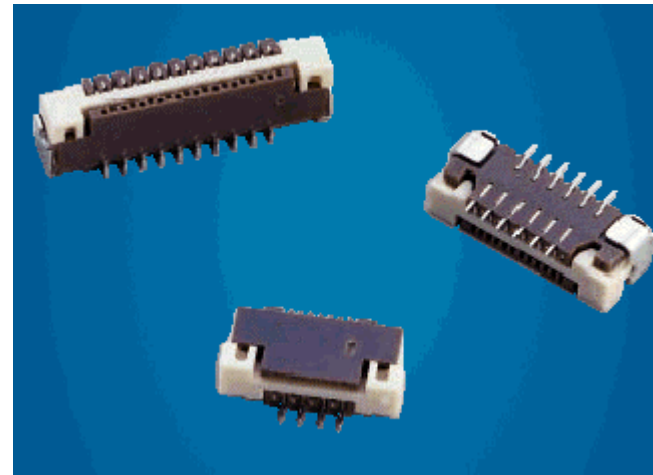
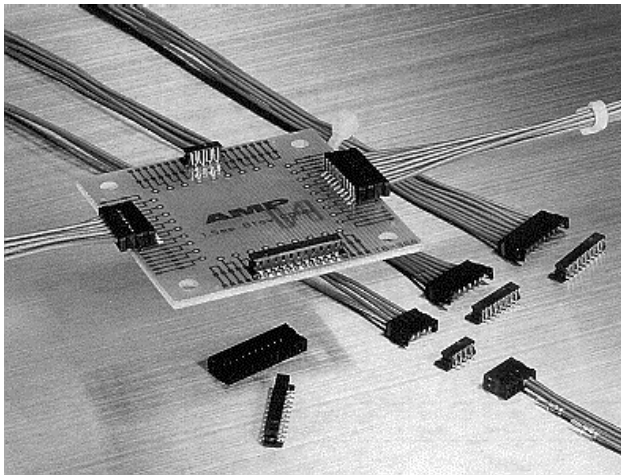
THESE TRACES  
REMOVED  
ON HV CABLE

CONTACT END OF PIGTAIL-  
PLUGS INTO: BERG 87768  
OR EQUIVALENT 18 POSITION  
CONNECTOR IN SAME FAMILY.  
DEFINED IN: [BERG\\_FPC.PDF](#)

# PIXEL DETECTOR PIGTAIL LAYOUT



AMP MINI  
VIBRATION  
PROOF



BERG 0.5MM  
DOUBLE ROW  
ZIF FPC

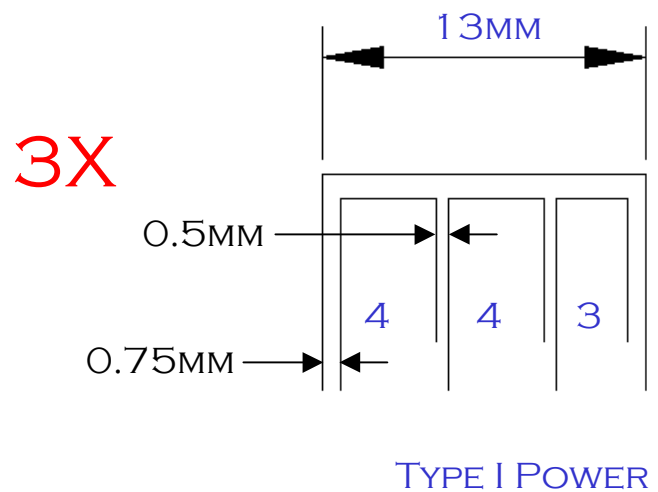
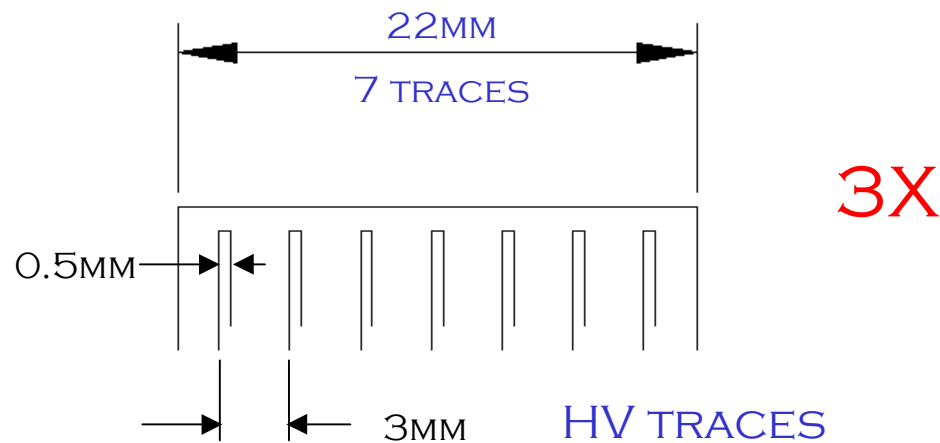
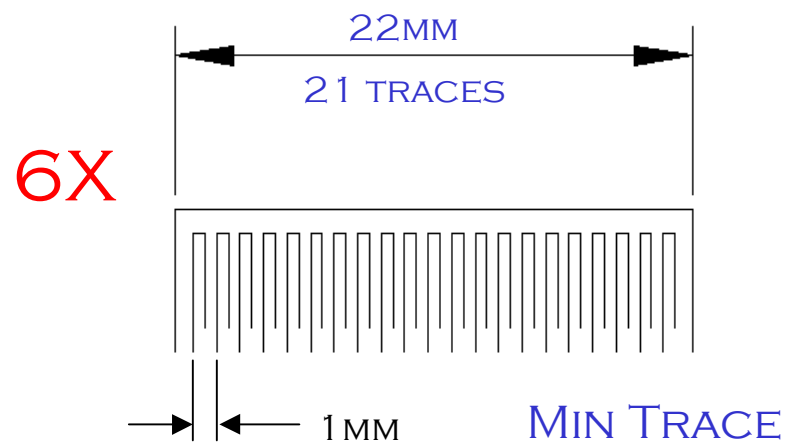
# PIXEL DETECTOR

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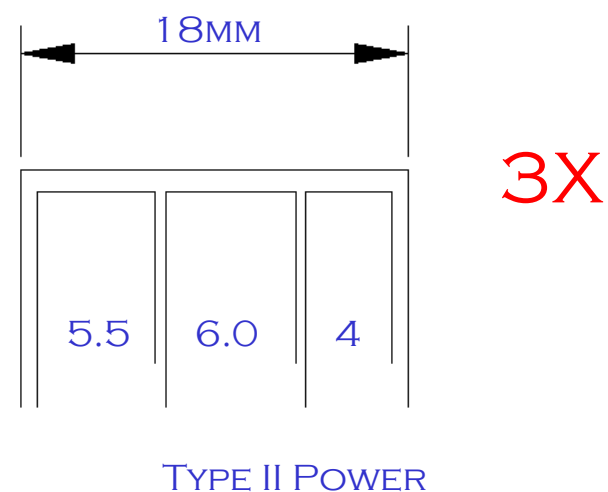
## LONG FLEX CABLES (TYPE I & II)

- **EXPOSURE TABLE IS READY**
  - INTERLOCKS INSTALLED AND TESTED
  - UV BACKGROUND ADEQUATELY CONTROLLED
  - EXPOSURE VELOCITY RANGE HAS BEEN FULLY QUALIFIED
  - ETCHANTS FOR COPPER HAVE BEEN TUNED
  - ALUMINUM HAS BEEN TRIED SUCCESSFULLY—QUALITY NEEDS TO BE ASSESSED IN GREATER NUMBERS
- **ARTWORK FOR PROTOTYPE CABLES IS MADE**
  - SURPRISINGLY SIMPLE TO MAKE, IF NOT EXACTLY CHEAP
  - EXPECTED AT LBNL BY END OF WEEK
  - INCLUDES ALL TYPES OF FLEX CABLE (PRODUCTION ART WILL NOT MIX CABLE TYPES)
- **FIRST CABLES EXPECTED BEFORE CHRISTMAS**
  - ART LAID IN NEXT WEEK
  - ONCE IN PLACE ONE DAY TURN-AROUND SHOULD BE FEASIBLE

# VARIOUS CABLES ON PROTOTYPE ARTWORK



3 SETS OF CABLES  
FIT ONTO ONE FILM  
2 MIN TRACE PARTS  
ARE REQUIRED FOR  
EVERY POWER/HV  
CONDUCTOR





ATLAS

# PIXEL DETECTOR EXPOSURE TABLE IN OPERATION

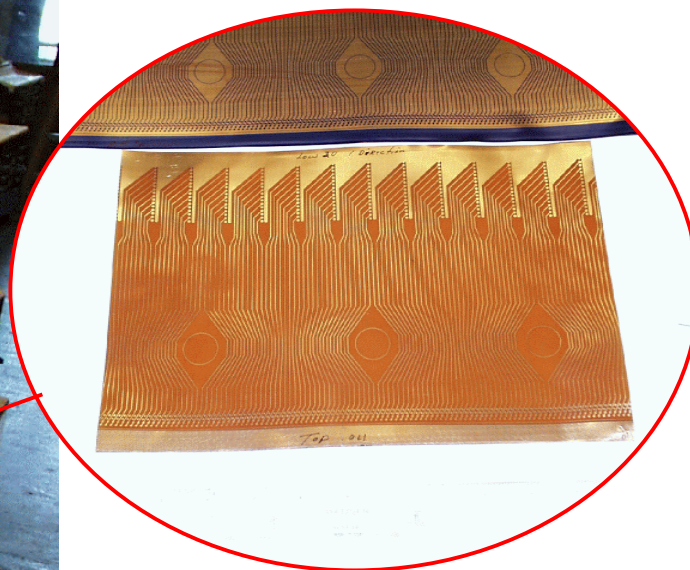


DECEMBER 99  
MEETING

*PIXEL DETECTOR INTEGRATION*  
E. ANDERSSON LBNL



# PIXEL DETECTOR QUALIFICATION RUNS



TESTS ON ARTWORK WITH  
SIMILAR PITCH YIELD GOOD  
RESULTS IN COPPER

PRELIMINARY RESULTS ON  
THICK ALUMINUM (75MICRON)  
LOOK EXCELLENT

# PIXEL DETECTOR

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## CONVENTIONAL CABLES

- **INTERESTED IN DETERMINING PERFORMANCE OF FULL CHAIN**
- **WOULD LIKE TO KNOW AS SOON AS FEASIBLE, BUT WOULD PREFER DECISIVE INFORMATION**
- **IMPACT OF FE-D ON MODULE AVAILABILITY TO TEST CABLES?**
  - NEED (SEVERAL) GOOD WORKING MODULES TO TEST CABLES EFFECTIVELY
- **QUESTIONS OF PRIORITY**
  - CAN PUSH AHEAD TO DELIVER CABLES, BUT HAVE OTHER THINGS THAT COULD BE SHUFFLED UP
  - MATTER OF ONLY ORDERING CABLES AND CONNECTORS, PUSHING THROUGH FAB-APPROX ~6WKS ARO REGARDLESS OF WHEN
  - CAN DELAY WITHOUT MUCH OTHER IMPACT THAN IT GETS DONE LATER
- **FLEX CABLES WILL BE PUSHED AHEAD REGARDLESS TO MAINTAIN CURRENT MOMENTUM, AND CARRY IT INTO PIGTAIL PROTOTYPING (MECHANICALLY REAL)**

# PIXEL DETECTOR

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## INTEGRATION ISSUES

- **CABLE OCCUPANCY IN REGION THROUGH NOOSES IS CRITICAL, HOWEVER:**
  - VOLTAGE DROP IS NOT A PROBLEM
  - CONNECTORS ALSO NOT A PROBLEM DUE TO GEOMETRY OF REGION
  - COPPER ONLY ~ 10% OF CROSS SECTION MEANING:
    - INSULATION AND PACKING IS VERY INEFFICIENT
    - *MUST PUSH ON NEED FOR TWISTED PAIR-REPRESENTS 30-35% REDUCTION IN AREA*
    - CABLE INSULATION TECHNOLOGY SHOULD BE PUSHED
    - FIRE REGULATIONS AND TYPICAL CONVENTIONS MUST ALSO BE QUESTIONED
- **OTHER ISSUES TO FOLLOW UP ON**
  - ASKED TO LOOK AT CHANGING POSITION OF PP3 FROM SERVICE PLATFORM TO  $Z=0$  IN MUON CHAMBERS
    - NOT VERY ACCESSIBLE, BUT SHORTER LENGTH
    - INSIDE MAGNETIC FIELD
  - *CHANGE OF MODULARITY (SAVES INSULATION WHICH IS OUR REAL PROBLEM)*
  - *DISCUSS NEED FOR SENSE WIRES AND TO WHERE*

# PIXEL DETECTOR PPB2 REGION

